Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 101 of the	)	
Commission's Rules to Facilitate the	)	WT Docket No. 10-153
Use of Microwave for Wireless	)	
Backhaul and Other Uses and to	)	
Provide Additional Flexibility to	)	
Broadcast Auxiliary Service and	)	
Operational Fixed Microwave Licensees	)	WT Docket No. 09-106
	)	
Request for Interpretation of Section	)	
101.141(a)(3) of the Commission's	)	
Rules Filed by Alcatel-Lucent, Inc., *et al*.	)	
	)	
Petition for Declaratory Ruling Filed	)	
By Wireless Strategies, Inc.	)	WT Docket No. 07-121
	)	
Request for Temporary Waiver of	)	
Section 101.141(a)(3) of the	)	
Commission's Rules Filed by Fixed	)	
Wireless Communications Coalition	)	

SUPPLEMENTAL COMMENTS OF THE FIXED WIRELESS COMMUNICATIONS COALITION

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EXECUTIVE SUMMARY

The Fixed Wireless Communications Coalition ("FWCC") opposes any rule change that would effectuate Wireless Strategies, Inc.'s ("WSI") proposal to allow the use of auxiliary multipoint stations with point-to-point microwave links. This proposal has been under consideration for more than three years and has been subject to widespread opposition. The record shows that the proposed auxiliary stations would pose an unacceptable risk of interference to point-to-point microwave operations and would reduce spectral efficiency.

With respect to interference, the proposed rules would incent an increase in the number of high-power licensed stations, deployed with the intent of increasing side-lobe radiation to as large an area as possible, which, coupled with the exemption of antenna standards for auxiliary stations and the use of time division duplex ("TDD") modulation, clearly will increase the potential for interference to incumbents and new entrants. The proposed rules also would make point-to-point microwave bands spectrally inefficient. As well, allowing auxiliary multipoint stations would create an undue burden on wireless microwave incumbents and new entrants, which would have to expend much more time and money to identify and resolve interference from auxiliary stations.

Given that there already is spectrum allocated by the Commission for point-to-multipoint use, for which commercial equipment is available, and given that many present point-to-point microwave bands are overcrowded, any business model that requires use of auxiliary microwave stations should look to these bands for potential operations. The WSI proposal is not a viable spectrum management solution, and the FCC should reject any rule changes in furtherance of this proposal.

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In its Notice of Proposed Rulemaking and Notice of Inquiry ("NPRM/NOI") in the above-captioned proceeding,[1] the Commission seeks comment concerning measures to reduce regulatory barriers to the use of spectrum for wireless backhaul, point-to-point communications, and point-to-multipoint communications. The

[1] *Amendment of Part 101 of the Commission's Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Service and Operational Fixed Microwave Licenses; Request for Interpretation of Section 101.141(a)(3) of the Commission's Rules Filed by Alcatel-Lucent, Inc., et al.; Petition for Declaratory Ruling Filed by Wireless Strategies, Inc.; Request for Temporary Waiver of Section 101.141(a)(3) of the Commission's Rules Filed by Fixed Wireless Communications Coalition*, Notice of Proposed Rulemaking and Notice of Inquiry, WT Docket Nos. 10-153, 09-106 and 07-121 (rel. Aug. 5, 2010) ("NPRM/NOI").

Commission is endeavoring to "increase opportunities" for point-to-point and point-to-multipoint users "while protecting established license holders."

Among other things, the Commission seeks comment on rule changes that are based on a Petition for Declaratory Ruling filed by Wireless Strategies, Inc. ("WSI") seeking to allow FS licensees to reuse microwave spectrum by operating "auxiliary" multipoint stations in conjunction with their existing microwave links.[2] The Fixed Wireless Communications Coalition ("FWCC") hereby comments on this issue.[3] FWCC has opposed and remains opposed to WSI's proposals, as they:

- Are inconsistent with the site-specific process the Commission long has employed for Part 101 point-to-point licensing;
- Would subject the installed base of microwave equipment to an increased risk of interference; and
- Would reduce microwave spectrum efficiency.

Any rule changes aimed at effectuating WSI's proposals would be detrimental to wireless microwave operations, particularly in the 6 GHz band. FWCC thus urges the FCC to reject WSI's proposals.

BACKGROUND

The FWCC is a coalition of companies, associations, and individuals interested in the fixed service -- *i.e.*, in terrestrial fixed microwave communications. FWCC's membership includes manufacturers of microwave equipment, fixed microwave engineering firms, licensees of terrestrial fixed microwave systems and their associations, and communications service providers and their associations. The membership also includes railroads, public utilities, petroleum and pipeline entities,

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[2] NPRM/NOI at ¶ ¶ 41-58 generally.

[3] These comments are limited to the WSI proposals. FWCC is filing separate comments addressing the remaining issues raised in the NPRM/NOI.

public safety agencies, cable TV providers, backhaul providers, and/or their respective associations, communications carriers, and telecommunications attorneys and engineers. FWCC members build, install, and use both licensed and unlicensed point-to-point, point-to-multipoint, and other fixed wireless systems, in frequency bands from 900 MHz to 95 GHz.

DISCUSSION

The Commission seeks comment on WSI's proposal to allow reuse of microwave spectrum using the side lobes of point-to-point links via distributed auxiliary multipoint stations. As the NPRM/NOI notes, this proposal has multiple opponents.[4] There is good reason for this opposition. Despite the fact that WSI has had more than three years to justify its proposal, its claims of potential benefits are largely unsupported, and WSI has not responded meaningfully to showings that auxiliary stations pose a risk of interference to microwave operations.

While the FWCC supports the FCC's work to foster more flexible use of the spectrum, and believes that allowing greater spectrum reuse is a laudable goal, WSI's proposals do not afford a workable basis for spectrum management. Rather, the proposals conflict with the Commission's stated goals of "avoiding interference to existing operations," "maintaining the reliability and integrity of existing systems," and "avoiding a situation where spectrum becomes unavailable."[5]

I. The Proposal is Inconsistent with the Commission's Microwave Licensing Regime.

Part 101 was developed specifically for point-to-point use, and has been crafted carefully to facilitate spectrum sharing between microwave systems and with other services operating in the same bands. To this end, the rules include minimum throughput and antenna requirements, appropriate power levels, and minimum path

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[4] NPRM/NOI at ¶ 46.
[5] *See* NPRM/NOI at ¶ 53.

length. The rules also include coordination and interference standards, created by TIA based on industry input. Additionally, applicants must provide specific information on siting and use because the interference performance of band users can vary significantly based on factors such as antenna characteristics, power levels, duty cycles, geographic propagation and emissions type.

These rules have fostered a spectrum environment in which point-to-point systems located in close proximity can co-exist. The rules were not conceived for point-to-multipoint operations, which the Commission has determined cannot coexist with point-to-point operations unless there is geographic licensing.[6]

WSI's proposals, if adopted, would initiate a radical departure from this regulatory regime. The Commission would be moving from a philosophy in which links are added as the need develops to one in which a user is incented to enter a band and dominate a geographic area to the preclusion of other users.

The Commission seeks comment on exempting auxiliary multipoint stations from many of the rules that control and effectively organize the spectral environment. Specifically, it asks about exempting auxiliary stations from the antenna standards, minimum path length requirements, and loading requirements that are applicable to main links.[7] These rule changes would be contrary to the public interest because they would undermine the carefully-crafted Part 101 licensing regime, the sharing environment Part 101 makes possible, and the densely-packed installed base of links that has developed under this regulatory regime.

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[6] *See Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40 GHz Bands*, Third Notice of Proposed Rulemaking, 19 FCC Rcd 8232 at ¶ 29 (2004).
[7] NPRM/NOI at ¶ 52.

II. Allowing Auxiliary Stations Would Increase Interference and Impair Spectrum Efficiency.

Adopting the WSI proposals would be extremely detrimental to the operations of current users. Rather than enhance spectrum efficiency, these proposals would lead to potential interference as well as spectral inefficiency.

The Commission seeks comment on the public interest implications if it were to "allow operation in the manner contemplated by WSI."[8] Based on WSI applications and other filings with the Commission, WSI plans to locate auxiliary stations near (typically within a few miles of) licensed microwave path endpoints using TDD transmissions, which would be time shared among the multipoint stations and the licensed route. The main microwave paths would be licensed at the maximum power permitted,[9] and auxiliary stations would use small, non-conforming antennas rather than the narrow pattern antennas typically used for point-to-point operations.[10] As discussed further below, this high-power, high-centerline approach on the primary link would significantly expand the potential interference effect on other operations, near and far, as energy would spread across the horizon far more than necessary, and would hamper the efficient use of the spectrum by others.

Potential for Increased Interference

Implementing WSI's proposals would result in a much larger potential interference area and have a preclusive effect on future applications in the same geographic area. Under the current rules, Part 101 microwave stations are required to use the minimum power necessary to carry out communications.[11] Under the proposed

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[8] NRPM/NOI at ¶ 50.
[9] FWCC calculates, based on WSI applications for links in Maryland, that WSI's system would operate at a power level at least 20 dB, or 100 times the power level, above what generally would be necessary to provide high availability point-to-point operations.
[10] FWCC notes that while WSI has referred to these antennas in previous pleadings as so-called "smart antennas," WSI has not explained what this term means in this context or how it envisions these antennas would perform.
[11] 47 C.F.R. § 101.113(a).

rules for auxiliary stations, on the other hand, maximum permissible EIRP on the licensed path could be used in order to meet the business needs of a point-to-multipoint operation.[12] It is self-evident that increasing the number of high-power licensed stations, deployed with the intent of increasing side-lobe radiation to as large an area as possible (to enhance the possibility of off-main beam communication with potential auxiliary multipoint stations) will increase the potential for interference to licensed incumbent and prospective point-to-point operations. As discussed further below, this interference potential is compounded by the use of time division duplex ("TDD") modulation which, when mixed with a large incumbency of frequency division duplex ("FDD") deployments, increases the potential for interference and decreases the overall efficiency of spectrum use in the area.[13]

FWCC is particularly concerned with the proposal to exempt auxiliary stations from the antenna standards required for point-to-point microwave links.[14] WSI has proposed use of so-called "smart antennas" for point-to-multipoint operations, claiming that this would save money. One problem with these small antennas is that, compared with the highly-directional antennas required for point-to-point operations, the small antennas are much less able to confine radiated energy to a narrow beam. In addition, the use of smaller antennas, which have less gain, require higher power to achieve an acceptable signal at the receive end of the path. Both of these effects cause the smaller antennas to radiate more potentially interfering energy outside the path, whereas the larger antennas meeting FCC standards that are used in present point-to-point microwave systems are much more focused and therefore effectively limit their potential for interference to other systems. Additionally, the suggested elimination of

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[12] As mentioned above, WSI has filed point-to-point applications to operate at power levels 20 dB above what ordinarily would be necessary for high availability point-to-point communications.

[13] FWCC notes that National Spectrum Management Association ("NSMA") guidelines developed several decades ago recognized the problem of mixed high and low transmission and recommended not combining TDD and FDD modulation in the same band.

[14] NPRM/NOI at ¶ 52.

antenna pattern requirements for these auxiliary stations would produce antenna radiation with unpredictable direction and amplitude. This is further complicated when a large number of these antennas are mounted low in a reflective environment. As a result, these "smart antennas," while perhaps lower-cost to the user, would create more inference potential and more difficultly with coordination, limiting the use of spectrum by others.

The Commission recognizes in the NPRM/NOI that it "would be necessary in order to effectuate a Part 101 regime including auxiliary stations "that "[a]uxiliary stations must not cause any incremental interference to other primary links, i.e., they must not cause any more interference to them than the main link would cause."[15] FWCC is concerned that "incremental interference" is not well-defined, and that coordination under this scenario would be difficult. Section 101.103(d)(1) requires applicants to avoid interference to other users and to avoid blocking growth of prior coordinated systems;[16] it is unclear how the auxiliary station inference rule would work in conjunction with Section 101.103(d)(1). In addition to the other problems described above, such a rule would increase the cost of coordination for new entrants, particularly in proximity to auxiliary sites, as well as increase the cost to incumbent licensees who must analyze multiple sites to determine if an interference objection should be filed.

The secondary status of auxiliary links will not resolve these issues because users essentially are left to identify and correct interference problems among themselves. Customers of established auxiliary multipoint operations, moreover, would likely resist efforts to cut off their service. As a practical matter, therefore, once an auxiliary station is established it will be difficult to get the station to cease service even if it is causing interference.

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[15] NPRM/NOI at ¶ 52.
[16] 47 C.F.R. § 101.103(d)(1).

The Commission seeks comment on requiring that auxiliary stations be coordinated in advance and that licenses be modified to add auxiliary stations.[17] Prior coordination of the auxiliary stations would partially ameliorate some of the interference concerns. However, the existence of auxiliary stations operating subservient to a primary link would make coordination much more complicated – and costly – because with a number of auxiliary multipoint stations associated with the link (and with the expectation of frequent changes as the market churns), it would be more difficult to determine which auxiliary station could cause or is causing interference. Sending engineers into the field to study the situation would entail much more time and cost to effect interference resolution than under the present rules. With the current coordination process used by industry, if there is a likelihood of interference to an incumbent by a new entrant, the situation is often resolved by upgrading the new entrant's or incumbent's antenna to allow the two systems to coexist. Under the proposed new rules, it will be difficult to impossible to make changes to a main link associated with auxiliary stations because of how the main link has been established for the purpose of serving the auxiliary sites.[18]

The Commission specifically sought comment on whether implementing an auxiliary station regime along the lines outlined in the NPRM/NOI "would strike the appropriate balance between auxiliary stations" and primary microwave links.[19] The answer, clearly, is no. This regime would increase interference potential and place an additional, and significant, burden on incumbents to identify and resolve interference from multiple auxiliary stations.

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[17] NPRM/NOI at ¶ 52.
[18] Given that the side lobe radiation is essentially the service, the licensee would either not want to or potentially would be unable to make changes.
[19] NPRM/NOI at ¶ 57.

Spectral Inefficiency

The auxiliary station regime envisioned in the NPRM/NOI would create incentives to use spectrum inefficiently. An operator seeking to use auxiliary multipoint stations would employ the highest possible power in its main link to blanket a wide area with strong signals rather than employ the minimum necessary power to provide adequate path availability. This is inefficient by any standard.[20] In addition, the point-to-multipoint operator would be strongly motivated to use small antennas with no antenna pattern requirement for the auxiliary stations, because using a more focused antenna would shrink the area of operations for the main link, severely restricting the business case for auxiliary operations.[21] Finally, given that multiple auxiliary multipoint stations are proposed to share frequency assignments with the main link, time sharing of the frequency (via use of TDD) is a necessity.

The higher power levels that would be used by the primary link for communication with auxiliary stations, coupled with the use of TDD modulation between the main and auxiliary stations and deployment of less efficient antennas, would cause a much greater spread of interfering energy across the horizon. This would have a preclusive effect on establishment of new sites, both near the primary link and far away. Use of the auxiliary stations, therefore, would not increase overall throughput, but would only share the same payload among multiple paths.[22] In addition, because the same frequencies are used in both directions on the primary link,

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[20] To establish a hub able to reach multiple auxiliary stations, greater power is needed to cover this larger area. Also, auxiliary stations would receive *de facto* frequency protection under the license of the main link, a further incentive to coordinate the main link at maximum power.

[21] The antenna standards in the present rules have been an important means to maximize efficient use of the spectrum because use of measured antenna performance data improves the quality of frequency coordination and increases the density of spectrum use. The proposal to not require specific antenna standards causes FWCC grave concern.

[22] With TDD modulation, when a main link is communicating with an auxiliary station it is sending data to that auxiliary station to the preclusion of communicating with the main link. So the systems contains the same capacity, which while spread between multipoint stations has not increased the payload.

the interference effects of the antennas' main beams on each frequency must be accounted for in two directions instead of one.[23]

It is well known that allowing FDD and TDD operations in the same frequency band is spectrally inefficient. While the Part 101 rules do not disallow use of TDD, incumbents uniformly use FDD in the bands at issue. Links are coordinated based on use of FDD, meaning transmitters on the lower end of the band are matched with receivers on the higher end of the band, and vice versa.[24] This allows application of high-low frequency plans (in concert with the FCC-specified channel pairs) to facilitate minimization of co-channel and adjacent channel interference at the same or nearby sites (known as bucking interference) caused by direct antenna-to-antenna interference or reflected interference from a transmitter into a co-channel or adjacent channel receiver.[25] The uniform use of FDD maximizes spectral efficiency. If WSI's proposals are adopted, however, TDD modulation between primary stations and between primary and auxiliary stations would be employed. The same frequencies would be in use at both ends of a link, thereby greatly increasing the probability for co-channel and adjacent channel interference. It is also significant that, even though a TDD station uses a frequency only part of the time (and that may be only a very small portion of the time in the case of an auxiliary multipoint station), that would prevent a FDD station from accessing a frequency (which it would use full-time) if coordination calculations establish a probability of interference. Under this scenario, a new user would be prevented from coordinating a link even though the TDD transmissions are not full

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[23] For example, National Spectrum Management Association recommendation, and coordination industry practice, is to study potential main beam interference to a distance of 250 miles in the 6 GHz and 11 GHz bands.

[24] *See* 47 C.F.R. § 101.147 (channel plans for 6 GHz and other bands).

[25] With FDD, a single set of frequencies from one portion of the band is used for all transmitters at a single location (or nearby locations) and another set of frequencies, from another portion of the band, is used for all receivers at these locations. This "high-low" approach minimizes interference among transmitters and receivers at the same and nearby locations. With a TDD approach, transmit and receive frequencies are the same, thus greatly increasing the probability of bucking interference when both FDD and TDD approaches are used in the same frequency bands in the same area.

time. Mixed TDD and FDD operation requires band segmentation or use of separate bands to control interference. FWCC advocates the use of separate bands for TDD and FDD because spectrum other than what is at issue here has already been allocated for point-to-multipoint operation.

Adopting WSI's proposals also would create an incentive to warehouse spectrum. If the goal of a service is to serve an entire area, as opposed to moving traffic from one point to another, operators would want to coordinate links to communicate with stations across an entire geographic area, whether or not there are existing customers, in order to maximize its customer marketing offerings. This is different from the business case of point-to-point operations, which simply seek to transmit information from one place to another. Once a set of point-to-multipoint links are coordinated in an area (for example, from a hub), that would preclude competitors from using those frequencies over a wide area, particularly given the high centerline, high power primary links. The existence of several high powered links in an area would dissuade new entrants.

Support in the National Broadband Plan for frequency re-use of microwave frequencies was based on the premise that doing so would increase spectrum efficiency.[26] As indicated here, and in multiple filings by other parties in response to WSI's declaratory ruling request,[27] re-use of the spectrum via these proposed rule changes create perverse incentives and would result in spectral inefficiencies.

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[26] National Broadband Plan, Section 5.5, Recommendation 5.10, p. 93 (released March 16, 2010).

[27] *See National Spectrum Management Association Ex Parte*, WT Docket No. 07-121 (filed May 20, 2010) (noting WSI's proposals are "diametrically opposed" to present microwave operations; "detrimental" to mobile broadband, public safety and other critical operations, and satellite earth stations; "spectrally inefficient;" and "makes frequency coordination impossible."); *Satellite Industry Association Ex Parte*, WT Docket No. 07-121, at 2-3 (filed June 21, 2010) (noting WSI's proposal "could radically alter the interference and sharing environment between the FS and FSS in shared bands"); Comments of Fibertower at 2 (filed Oct. 29, 2007) ("[c]oncurrent coordination of multiple links is likely to increase interference with other licensees' operations.").

III. Other Spectrum is More Appropriate for Auxiliary Use.

The FCC seeks comment on whether certain bands, and in particular 6 GHz, would be more or less well suited for use by auxiliary operations.[28] In particular, the FCC queries "whether there is sufficient capacity in [the] bands to accommodate many operations of the type contemplated by WSI, in addition to the existing uses in the band."[29]

Presently, the 6 GHz band is very efficiently, and heavily, used for point-to-point operations and, as discussed above, allowing auxiliary stations would increase the potential for interference, impede new entrants, and create spectral inefficiencies. The 6 GHz band was established specifically for long-distance use,[30] and the spectrum environment should not be changed to accommodate experimental operations that can be accomplished elsewhere. The present installed base of fixed microwave equipment came about because users have made investments in equipment and systems in 6 GHz and other bands in reliance on the present rules, and it would be unfair to alter the spectrum environment to their detriment.

The Commission requested comment on coordination experiences in the 6 GHz band. The lower 6 GHz band (5925 – 6425 MHz) is the last remaining band below 10 GHz able to support long links. It is extensively used throughout the country as evidenced by the approximately 39,000 licensed and applied-for channels, and it is shared with 1600 satellite earth stations. While there is congestion found in some areas, there is still overall success at coordinating and licensing new paths in the band based on the present Part 101 rules that encourage efficient use.[31]

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[28] NPRM/NOI at ¶ ¶ 55-56.
[29] NPRM/NOI at ¶ 56.
[30] The rules set out minimal path length requirements. 47 C.F.R. § 101.143.
[31] These include using the minimum EIRP necessary, employing high performance antennas, and meeting the payload capacity requirements.

As the FCC correctly points out, there is other spectrum available for point-to-multipoint operations. As a general rule, it is not good policy to place point-to-multipoint operations in the same band as point-to-point systems.[32] Given the concerns expressed above, the FWCC suggests that it would be more appropriate for WSI's proposed operations to be conducted in other bands that have been allocated for point-to-multipoint use rather than changing the rules to the detriment of point-to-point users. Suitable equipment is already available for some of these bands, and the higher frequency ranges would be suitable for short range applications such as the type of point-to-multipoint operations envisioned for auxiliary multipoint stations.

Finally, the Commission seeks comment on the types of operations for which auxiliary stations could be used,[33] as well as whether it should impose restrictions on locations of auxiliary stations.[34] For reasons discussed above, FWCC does not believe auxiliary operations can co-exist with point-to-point microwave operations. Therefore, consideration of such matters as the types of operations that should be conducted by auxiliary operations, or restrictions on locations of auxiliary stations, is not relevant.

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[32] *See supra* note 6.
[33] NPRM/NOI at ¶ 54.
[34] NPRM/NOI at ¶ 58.

CONCLUSION

FWCC opposes permitting FS licensees to coordinate and deploy auxiliary links, and urges the Commission not to adopt rules that would allow for these auxiliary microwave stations.

Respectfully submitted,

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